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ABSTRACT

The formulae developed to encourage the impersonal writing considered correct in academic disciplines have their roots in past gender-biased scientific writing in which "male" thinking and writing intervened to subjugate female Nature. Vestiges of this idea of a masculine order as a clearly superior state are present in the more traditional college writing courses that teach that impersonal/objective writing is not only different from more personal and subjective writing, but better. However, current writing in the sciences challenges the idea that mature exposition is impersonal--that it does not talk directly to the reader, that it is unpoetic, that it always sticks to a single and clearly defined point, and that it avoids generalizations. From Bertrand Russell to Lewis Thomas, scientific writing is filled with subjective observation and metaphorical language. If freshman composition instructors wish to help students make use of personal feelings and observations in their content area writing they can follow these suggestions: (1) organize course materials around a theme rooted in subjective experience but also applied to impersonal writing; (2) reward students' desires to see and write about impersonal subject matter against a personal backdrop; (3) encourage a mix of rhetorical modes within a single paper, while helping students do so consciously and selectively; (4) encourage experimentation with mildly innovative paragraph organization; (5) encourage organization that leads toward a question rather than an answer; and (6) encourage students to regard writing as a means of thinking rather than a reflection of fully completed thought. (NKA)

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ALTERNATIVE SHAPES IN EXPOSITORY WRITING

In an effort to fend off the accusation that we turn out students who cannot write, we who teach college English seem to have developed formulae (e.g., the five paragraph theme: thesis statement, three supporting paragraphs, conclusion) by which to mass produce passable college writers. We attempt to shuffle students as rapidly as possible through "experienced based" or personal essays to get them to the supposedly preferable impersonal writing we believe other disciplines demand. Often we try to reduce traditional rhetorical modes--comparison/contrast, classification, persuasion, etc,--to a formulated purity that is to be maintained regardless of what the writer actually wants to say. As a result we are in danger of losing sight of the fact that the primary purpose of writing is to say something. From my personal observation, it seems that we are already producing large numbers of students to whom this fact has never been revealed.

Our campaign of reduction-to-form, I believe, raises a genuine feminist issue, an issue that goes far beyond its immediate effects on women's writing: it touches directly on our culture's deeprooted perceptions and misconceptions of what "being feminine" and "being masculine" really mean. These perceptions affect not only how we write or teach writing but also how we regard other disciplines, especially the sciences, which presumably we are helping train college students to write about.

Evelyn Fox Keller, in her book REFLECTIONS ON GENDER AND SCIENCE, makes a convincing case for the idea that, throughout recorded history, the kind of thinking which seeks unity and continuity (likenesses among things, blurred or ambiguous differentiations among things), and which admits to subjectivity of perception, has been regarded as feminine; whereas the kind of thinking which seeks separation (dissimilarities among things, precise and quantified differentiations, discrete units) and which claims objectivity of perception, has been termed masculine.

Keller explores the gender metaphors that have been repeated again and again in the history of science: for example, the Baconian notion that the quantifying, differentiating "male" intellect can subjugate Nature and make her (always her!) both man's "chaste wife" and his "slave." "Male" thinking and writing must, in this historical view, both penetrate Nature to ferret out her secrets and impose order on her dark, amorphous, indiscrete and fearful forces. She may be mankind's Great Mother but she cannot do man's work without the intervention of masculine order. A shockingly clear-cut example of the gender bias past thinkers built into the language of science is provided by Scots biologist Patrick Geddes and his student J. Arthur Thompson, whose influential book THE EVOLUTION OF SEX, published in 1889, "characterized as female the qualities of passiveness, vegetativeness, and largeness, and as 'male' the qualities of high temperature, smallness and activity. This division translated into two types of physical activity--'anabolism,' or constructive metabolism, which was female, and 'catabolism,' which was destructive and male." (Betty Ann Kevles, FEMALES OF THE SPECIES, p. 10.)

Vestiges of this idea of masculine order as a clearly superior state are present in our more traditional college writing courses in the very sequence in which these courses present writing tasks: narration and description (if taught at all) as "easy" initial assignments, with "catabolic" writing like classification

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higher up on the scale, and argumentation (and its implication of victory by means of judiciously imposed order) as the final essay type, the goal toward which all the other kinds of writing have been working. Such course structures suggest, in other words, that good writing expresses masculine thought by which the dark forces of personal experience, imagination, multiple alternatives and the unknown are wrestled with and beaten by a pin. These courses teach, whether they explicitly intend to or not, that impersonal/objective/"purely factual"/strictly-differentiating writing is not only different from more personal and subjective writing, but better.

A questionnaire I recently administered to about 400 freshman and sophomore students at Towson State University revealed, among other things, that these students have, indeed, "learned" this value distinction. For example, 65% of the male students and 51% of the females strongly agreed with the statement, "Writing that affects history tends to be primarily factual" even though the examples given of such history-making writing included bursts of pure passion like The Gettysburg Address and the Declaration of Independence! Apparently they felt that, if the document carried real, world-affecting weight, it had to be a body of facts. For both males and females, nearly 50% of the students agreed that "Serious science avoids guessing," not recognizing that the guess or hypothesis is the basis for all scientific investigation. Over one fifth of both males and females maintained that "The imagination has no proper place in the exact sciences." A third of the males and a quarter of the females believed that "Ideas about the relationship between humans and the cosmos are more a matter of religion and philosophy than of science"--though one could argue that science is a way humans relate to the cosmos.

Judging from their writing in their fields, I suspect that most twentieth century scientists would be astounded and dismayed by those answers. If, indeed, a central goal of college writing courses is to help equip students to write for disciplines outside the English discipline--and the "hard" sciences seem to most of us English teachers as the disciplines farthest outside--than we must be aware that our downplay of the personal, the imaginative, the metaphoric and the tentative runs counter to the writing that scientists actually do today. True, science is responsible, in part, for the anti-female language our cognitive theory has been saddled with. But science's current writers seem to be transcending this kind of cognitive theory much faster than we English teachers are. While we are still teaching students the dogged impersonality of the scientist, the sciences have burst into poetry and metaphysics.

An idea that runs like a leit-motiv through twentieth century scientific writing is that virtually all scientific "facts" are subjective constructs dependent on the observer, and, further, that a scientist is wasting his or her time in attempting to wrestle the Unknown into submission by imposing his or her ideas of order. Here, for example, is a passage from mathematician/philosopher Bertrand Russell's essay, "What is Matter":

> What I wish to suggest may be put as follows. Everything that occurs elsewhere, owing to the existence of an atom, can be explored experimentally, at least in theory, unless it occurs in certain concealed ways. But what occurs within the atom (if anything occurs there) it is absolutely impossible to know: there is no conceivable apparatus by which we could obtain even a glimpse of it. An atom is known by its "effects." But the word "effects" belongs to a view of

> causation which will not fit modern physics, and in particular will not fit relativity. All that we have a right to say is that certain groups of occurrences happen together, that is to say, in neighbouring parts of space-time. A given observer will regard one member of the group as earlier than the other, but another observer may judge the time-order differently. And even when the time order is the same for all observers, all that we really have is a connection between the two events, which works equally backwards and forwards. It is not true that the past determines the future in some sense other than that in which the future determines the past: the apparent difference is only due to our ignorance, because we know less about the future than about the past. This is a mere accident: there might be beings who would remember the future and have to infer the past. The feelings of such beings in these matters would be the exact opposite of our own, but no more fallacious.
>
> It seems fairly clear that all the facts and laws of physics can be interpreted without assuming that "matter" is anything more than groups of events, each event being of the sort which we should naturally regard as "caused" by the matter in question. This does not involve any change in the symbols or formulae of physics: it is merely a question of interpretation of the symbols.
>
> This latitude in interpretation is a characteristic of mathematical physics.

Russell concludes the essay with a section that begins thus: "A definite and conclusive answer to our question is not possible, just because a variety of answers are compatible with the truth of mathematical physics."

Writing about entomology, zoology, animal physiology and related fields (see, for example, Dr. Howard Ensign Evans' oft-reprinted essay entitled, most "unscientifically," "In Defense of Magic: The Story of Fireflies") is especially noteworthy in its acceptance of the tentative--the guess, if you will--and the mysterious or unknowable. (Parenthetically, this may be because the biological sciences attract more women than the mathematical sciences do. Ruth Bleiser, ed. FEMINIST APPROACHES TO SCIENCE. Hilary Rose, "Beyond Masculinist Realities: A Feminist Epistemology to the Sciences," p. 57.) Betty Ann Kevles, in THE FEMALE OF THE SPECIES: SEX AND SURVIVAL IN THE ANIMAL KINGDOM (Harvard University Press, 1986), concludes her opening chapter, "Courtship," by insisting that our human observations about animal courtship rituals cannot and must not lead us to believe we know <u>why</u> these rituals exist:

> The bowerbird's magnificent, elaborate artistry is important in keeping a potential mate in tow, but his work plays no role in the actual courtship process, itself a separate set of ritualized steps that do not take place in the bower. Likewise, the songs of many species of birds are far more complicated than necessary to send a message to a mate. Though the heart of a ritual may have had an evolutionary function, a practical purpose when it first began, rituals may become so removed from the original functions of the component parts that the initial purpose is lost or overwhelmed in the elaborated pattern.

> Rituals continue nonetheless, even when the reasons for which they may have evolved are no longer obvious. All behavior, as well as all anatomical structures, probably had some function in the evolutionary past. But just as we retain an appendix which at some distant time may have functioned as part of our digestive system, cats continue biting each other's necks as they copulate. There is not necessarily a purpose for every current structure, or a functional reason for every contemporary gesture. What had a quite different use in the evolutionary past can sometimes linger into the present because it is harmless and simply not relevant to the fitness of the living animal.

Yet Kevles also uses human terms to help her readers share--share, not explain--zoologists' personal observations of such rituals, as in the following passage:

> Zoologists hypothesize that many females, like the American tree squirrel (Scuridae), feel torn between two powerful instincts: they want to escape and at the same time they want to greet the male. A common resolution to this conflict is a ritualized chase. The grey squirrels will run after each other for up to an hour. At the beginning of the spring, the female may teasingly engage the male in a fruitless run because she is not ready to be caught. But as the days wear on, the chase becomes more serious. She jumps from branch to branch, the male close in pursuit, letting him gradually close the distance between them. She leads the way and if he falls too far behind, she turns and checks and stops to let him catch up.
>
> Cheetahs enjoy a good run too. The female sometimes leads the cluster of males she has gathered on a chase around her territory, exhausting all but the one with whom she eventually mates. The males may fight each other while chasing her, but she spparently ignores their interactions and chooses independently. Each chase follows the same pattern. About a 100-yard run, then a tackle in which the cats play-fight, play-bite, and jump on top of one another like house kittens.

Kevles' writing applies the imagination to personal observation and, at the same time, reminds us that "facts" per se, provable packets of information, are not to be had. Neither of the stances would be admired in a traditional freshman argumentation paper, I suspect.

What I have been trying to suggest so far is that current scientific thinking and writing challenge the traditional teacher of writing's ideas about the objectivity and definitiveness with which we are able to say things. This is a rather large, rather abstract concept. But current scientific writing also challenges traditional tenets of "solid expository writing" in smaller, more specific ways. (For "solid," read good, mature, strong, clear, masculine.) It challenges the idea that mature exposition is impersonal; that it doesn't talk directly to the reader, much less chat with him or her; that it is unpoetic--that is, not lyrical, fanciful, metaphoric; that it is never, never "cute"; that it always sticks to a single, clearly defined point; and that it avoids sweeping generalizations.

Even the briefest look at each of these propositions in turn, while dipping more or less randomly into current essays on science by scientists, demonstrates how inaccurate they are. Let me give you a few specific instances that call these propositions into question.

Probably all of us have, at one time or another, indicated to our students that mature, serious exposition is impersonal and does not converse directly with the reader. And most of us have taught students in our freshman writing courses who have been taught somewhere along the line that a formal paper never contains the word "I," much less makes direct reference to a personal, individual thought or feeling when dealing with a "public" topic, like science. These are the same students who, asked to write about, say, the nocturnal activities of racoons, believe the teacher wants them to look up "racoon" in a reference text instead of describing what they have watched actual racoons do to the college garbage dumpsters every night. But many science writers today have no qualms about calling themselves "I" or about narrating and describing individually observed events. Case in point: of 26 essays on science by scientists in a widely-used college text called WRITING ABOUT SCIENCE (Bowmen and Mazzeo, 1979), 13 are written in the first person and several more quote lengthy first-person passages from other scientific treatises. About the same proportion of essays in this text are addressed directly to an audience referred to informally as "you," something which traditional teachers of expository writing also tend to adjure for reasons of attaining impersonality.

Here is a representative passage--by George and Muriel Beadle, in an article on the Mendelian Laws:

> "It's true that scientists strive for objectivity; what's more, they achieve it more often than other men (sic). But they are no more capable than other men of maintaining absolute neutrality toward the outcome of their work. Nor could you (italics theirs), if you were testing an original hypothesis that you believed to be both unique and imaginative. Who among us would not like to make a successful thrust into the unknown, to find a missing link, to break a code?"

A casual reader can find examples of personal observation informed by personal feeling merely by flipping open any book of recent scientific writing. Here, for example, is David Rains Wallace writing about the life of the wilderness on an Ohio sandstone ridge in the face of environmental disruption:

> The moon began to wax after the snowstorm, and the nights were increasingly brightened by its reflection from the white ground. The cold made the air unusually clear, and the stars rivaled the city lights to the west. Orion vaulted above the eastern horizon. The bitter January nights had a hushed intensity that set the ridge apart from the roar of cars along the nearby country road. Owl calls seemed surprisingly loud in the hush. A barred owl--gray feathered and black eyed--loitered on the ridge a few nights and added its repertoire of barks, giggles, and shrieks to the deep, rhythmic hooting of the resident horned owls. The screech owls had stopped calling, having perhaps migrated away from the harsh conditions.
>
> At first sight the snowy nights were like moonscapes--embodiments of frigid sterility--but there was life in them, as the owl calls indicated. Cottontail rabbits emerged from daytime shelter in drainage tiles or groundhog holes and wore dozens of paths through the brushy abandoned orchards. They dug into the snow to eat rotten apples or stretched up on their hind legs to gnaw the cambium of apple saplings. They could put these meager foods to good use because of an ingenious

> adaptation of rabbits. Their intestinal tracts produced special, soft fecal pellets full of protein-rich bacteria, which had digested the cellulose of the apples or bark. The pellets were nutritious and easily digestible--the rabbits ate them after excreting them. Any cellulose not assimilated in this way was excreted again as the ubiquitous, hard rabbit dropping.
>
> This adaptation was the base of the major winter food pyramid on the ridge.
>
> --IDLE WEEDS: THE LIFE OF AN OHIO SANDSTONE RIDGE, Ohio University Press, 1980, pp. 24-25.

There are few subjects more earthy and yet public than manure, and certainly the role of rabbit dung in the food chain is a serious scientific concern. Yet for the author this subject occasions a burst of lyricism.

The poetry of at least one branch of science, physics, has by now become a cliché. In addition to habitually describing the newly-discovered motions of the cosmos in terms that push the poetic to the mystical, physicists are forced by the wildness of the phenomena they seek to describe to rely on metaphor in order to be understood at all. For one obvious, small example--we are probably all familiar with Albert Einstein's much-quoted metaphor, "God does not play dice with the universe." When famous post-Einsteinian astrophysicist Stephen Hawking challenged this idea, he chose the same metaphor by which to do so: "God not only plays dice, but sometimes he throws them where they cannot be seen." (Boslough, STEPHEN HAWKING'S UNIVERSE, New York, 1985, p. 45.)

Again, one can find examples of metaphor as tool of the science writer just by randomly thumbing any text. Here is Sir James Jeans, world-renowned physicist, in his book PHYSICS AND PHILOSOPHY (New York, 1942, reprinted in 1981), writing about the movement of electrons in the theory of Bohr:

> A theoretical investigation which Einstein published in 1917 provides a third conspicuous landmark. It connected up the two great landmarks already mentioned by showing that the distintegration of radioactive substances is governed by the same laws as the jumps of the kangaroo electrons in the theory of Bohr. In fact radioactive atoms were now seen merely to contain a special breed of kangaroos, much more energetic and ferocious than any that had hitherto been encountered.
>
> The laws which governed the spontaneous jumps of kangaroos were shown to be of the simplest; out of any number of kangaroos a certain proportion always jumped within a specified time, and nothing seemed able to change this number. Also, before the jumps took place, there was nothing in the world of phenomena to distinguish those kangaroos that were about to jump from those that were not--neither good nor bad treatment could make a kangaroo jump until it hopped out, apparently of its own accord, to help fill the quota demanded by the statistical law. As discontinuity marched into the world of phenomena through one door, causality walked out through another. We shall see later why this had to be.

Note with what matter-of-factness there metaphoric kangaroos are given to us. They are silly, but they are also serious--and they help us "see" those invisible particles jump. If metaphor is the stuff of poetry, it is also necessarily the vehicle for writing about physics, since physics itself is a model or metaphor for the way matter behaves according to the particular observation of individual physicists.

Just as a poet may insist on the validity of his/her observations about the universe, so may a scientist, even when such an observation may be so vast, so grotesquely sweeping, that it outdoes the wildest excesses of a Walt Whitman--or a naive freshman writer. Again the science of contemporary physics provides us with a most telling example. In the forefront of today's theoretical physicists are the seekers after a Unified Field Theory, whose aim it is to find "a single interaction at the heart of the universe, one that will explain all of the phenomena that surround us." (Italics mine. Boslough, STEPHEN HAWKINGS UNIVERSE, op. cit., p. 15.) Of this search, physicist Murray Gell-Mann writes, "It is difficult to imagine that a handful of residents of a small planet circling an insignificant star in a small galaxy have as their aim a complete understanding of the entire universe. . . ." (ibid.) Surely the vast singleness of Unified Field Theory resembles the dark One, the all-encompassing Mother, Francis Bacon tried to teach us we must use "masculine" differentiating to subdue. Doesn't modern physics itself teach us that we must seek a way to deal with "her" whole?

One other way in which scientific writing flies in the face of our "rules" for solid expository writing is that scientists who write not only don't feel obliged to stick to a single rhetorical mode but also don't feel bound to stick to the ostensible subject. A typical scientific article defines the issue, states a hypothesis, describes the experiment, narrates the progress of the experiment, compares the experimental group with a control group, classifies the results, and argues for the validity of certain conclusions or, in short, makes use of all the rhetorical modes we teach as separate entities. But let us consider other kinds of articles by scientists. Dr. Lewis Thomas, for an obvious example, has made a stock-in-trade of moving from one minutely observed biological phenomenon through analogues in human sociology to philophical speculation on the nature of nature. Dr. Norbert Wiener, the mathematician who coined the term "cybernetics," in an essay called "The Moral Problems of a Scientist: The Atomic Bomb, 1942--," narrates phonecall by phonecall the development of his moral crisis related to the Manhattan Project and interlards his discussion of the atomic bomb with what appear to be asides about the development of "the automatic factory," a phenomenon we now know as computerized industry. The ultimate point of the essay is to show how, for him, scientific morality must address the implications not only of spectacular explosions but also of advances in the workaday world. Unlike a freshman aiming for an A in expository writing, however, Wiener does not sort out for us the ideas leading to this conclusion--because the conclusion itself is that the ideas are unsortable and inseparable.

Some years back I suspect that I myself would have given Dr. Wiener no more than a C-minus on this moving, disturbing, important yet weirdly shaped essay. But not today--for I have radically revised my teaching of freshman writing in light of what I have internalized from reading feminist pedagogy. Here are some things I do now, in an effort to help my students make use of their own feelings and personal observations about their world in writing across the curriculum.

1. Organize course materials around a theme that can be rooted in subjective experience but also applied to more impersonal thinking and writing. For example, using "The Family" as a theme allows students to start writing about subjective areas like their position in their own families, gender roles in their families, and the like, but move to a similar examination of a fictional family in a novel (e.g., Anne Tyler's DINNER AT THE HOMESICK RESTAURANT) and to analysis of the studies in Ruth Benedict's landmark text in cultural anthropology, PATTERNS OF CULTURE.

2. Reward rather than denigrate students' desire to see and write about impersonal subject matter (e.g., the family structure in Dobuan society) against a personal backdrop (e.g., the students' own families or extended families represented by their dorms, sororities, social clubs, etc.).

3. Spend as much as 50% of class discussion time talking about how students can find, within the assigned subject area, "personalized" topics that tap into what they know, feel, believe, or are interested in. For example, I recently had a student who, as a member of a fundamentalist religious sect, was so offended by the lifestyle of the Dobuans in PATTERNS OF CULTURE she was unable or unwilling to write about it. She told me it seemed to illustrate what the Gospels taught about the godless not prospering. When I told her to make that Biblical text the starting point for a paper about how the Dobuans have, indeed, not prospered as a group because of lacking any central unifying force, such as law or religion, she was able to turn in a very respectable piece of work.

4. Strongly encourage a mixture of rhetorical modes within a single paper, while helping students to do so consciously and selectively. During peer editing sessions, for example, student "editors" try to label each paragraph in the paper they are reading according to its rhetorical type and/or function in the paper as a whole.

5. Encourage students to experiment with mildly innovative paragraph organization, such as the "point last" paragraph.

6. Encourage paragraph and whole-paper organization that leads toward a question (or series of questions) rather than an answer.

7. Encourage students to regard writing as a means of thinking rather than a reflection of fully-completed thought--for instance, in writing about a book, to choose for a topic the passage or concept that most confused or troubled them.

8. Return to the home base of personal writing periodically throughout the semester, so that students learn the difference between personal and more objective expression without "learning" that one mode is intellectually and morally preferable to the other.

In sum, I believe we can do a better job of preparing our students for writing in our own discipline, for "writing across the curriculum," and particularly for writing about the sciences, if we turn away from the masculinism of the early scientist-philosophers and look toward the highly personal and imaginative writings being done in the sciences today.